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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
JUNG, UNSU	
ART UNIT	**PAPER NUMBER**
1641	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/10/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/809,318	DENES ET AL.	
	Examiner	Art Unit	
	Unsu Jung	1641	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 January 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/24/07 & 1/25/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's amendments to the specification and drawings in the reply filed on January 24, 2007 have been acknowledged and entered.

2. Applicant's amendments to cancel claims 18-33 and amend claims 1, 2, and 15 in the reply filed on January 24, 2007 have been acknowledged and entered.

3. Claims 1-17 are pending and under consideration for their merits.

Information Disclosure Statement

4. The information disclosure statements submitted on January 24, 2007 and January 25, 2007 have been considered.

Objections Withdrawn

5. Applicant's arguments, see p7, filed on January 24, 2007, with respect to the objection of the drawings have been fully considered and are persuasive. The objection of the drawings has been withdrawn in light of the amended specification and Fig. 3 in the reply filed on January 24, 2007.

Rejections Withdrawn

6. Applicant's arguments, see p7, filed on January 24, 2007, with respect to the rejection under 35 U.S.C. 112, second paragraph have been fully considered and are persuasive. The rejection of claims 1-17 under 35 U.S.C. 112, second paragraph has been withdrawn in light of the amended claims 1 and 2 in the reply filed on January 24, 2007.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1-8, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. (U.S. PG Pub. No. US 2002/0110932, Aug. 15, 2002) in view of Hubbell et al. (U.S. PG Pub. No. US 2002/0128234, Sept. 12, 2002) and Schössler et al. (U.S. Patent No. 4,822,681, April 18, 1989).

Wagner et al. teaches methods and devices for parallel, in vitro screening of biomolecular activity using miniaturized microfabricated devices. The biomolecules immobilized on the surface of the devices include proteins (Abstract) and polynucleotides (oligonucleotide, p3, paragraph [0039]). The reactive site of the device may comprise a coating between a substrate and its organic thin film. This coating can be formed on the substrate by plasma exposure, which can be used directly to activate the substrate to expose polar functionalities such as hydroxyl groups (step (a), p8, paragraph [0092]) and the substrate may be either organic or inorganic and may comprise a material selected from a group consisting of silicon silica, quartz, glass, carbon, titanium dioxide, etc. (p6, paragraph [0075]). Deposition or formation of the coating on the substrate must occur prior to the formation of organic thin films (p8, paragraph [0097]). A variety of different organic thin films are suitable including

molecules of the formula X-R-Y where R is a spacer, X is a functional group that binds R to the surface, and Y is a functional group for binding proteins onto the monolayer (p8, paragraph [0099]). X group may be chosen as any group, which affords chemisorption or physisorption of the monolayer onto the surface of the substrate (p9, paragraph [0103]). Methods for the formation of organic thin films include *in situ* growth from the surface, deposition by physisorption, spin-coating, chemisorption, self-assembly, or plasma-initiated polymerization from gas phase [p8, paragraph [0099]). However, Wagner et al. fails to teach a step of reacting a first gas comprising epoxy-functional molecules with the surface hydroxyl groups in situ in the absence of plasma to provide surface-bound spacer chains.

Hubbell et al. teaches that functional groups such as epoxy can interact with amine, hydroxyl, or thiol groups (p6, paragraph [0058]).

Schössler et al. teaches a method of reacting hydroxyl-group-containing solid body surfaces with glycidoxypropyltriethoxysilane (column 4, lines 26-29). With this variation, the biological materials to be bound react directly with the epoxy-groups of the solid body surface (column 4, lines 29-31). Herewith it is important that the reaction with the organosilanes, which are non-toxic and are produced to considerable extent on a large scale, be effected by simple contact or immersion, with the activation taking place in swollen or non-swollen state of the solid body, or even in the gaseous phase (column 4, lines 31-36). It is of greater importance herewith that the reaction with organosilanes can follow in liquid phase with organic solvents, such as acetone, toluene, dioxane, methanol, ethanol, among others, solvent mixtures such as

methanol/ethanol, as well as in aqueous milieu or water/solvent mixtures, such as methanol/water or ethanol/water, so that in contrast to many other activation techniques, the technological expenditure is lower (column 4, lines 36-44). It is particularly advantageous to effect the activation in gaseous phase through employment of aerosols or by means of underpressure (column 4, lines 44-47).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include in the method of Wagner et al. with a spacer molecule X-R-Y, wherein X is an epoxy functional group as taught by Hubbell et al., in order to bind the spacer molecule to a substrate surface of Wagner et al. with hydroxyl groups as Wagner et al. teaches that the X group may be chosen as any group, which affords chemisorption or physisorption of the monolayer onto the surface of the substrate. In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ a method of reacting a gas comprising spacer molecules with epoxy functional groups with the surface hydroxyl groups in situ in the absence of plasma as taught by Schössler et al. as activation in gaseous phase through employment of aerosols or by means of underpressure provides an activation technique, which has lower expenditure compared to other activation techniques. The advantage of employing an activation technique with lower cost provides the motivation for combining the teachings of Wagner et al., Hubbell et al., and Schössler et al. with a reasonable expectation of success as Wagner et al. teaches that monolayer can be formed comprising spacer molecules in gaseous phase.

With respect to claim 2, Wagner et al. teaches a method further comprising immobilizing biomolecules on the surface by reacting the biomolecules with surface-bound spacer chains (p9, paragraph [0112]).

With respect to claim 3, Wagner et al. teaches a method, wherein the biomolecules are amine-functionalized or amine-containing biomolecules (p12, paragraph [0135]).

With respect to claim 4, Wagner et al. teaches a method, wherein the oxide surface comprises a silicon oxide (p6, paragraph [0075] and p9, paragraph [0104]).

With respect to claim 5, Wagner et al. teaches a method, wherein the oxide surface comprises silica, glass, or quartz (p6, paragraph [0075]).

With respect to claim 6, Wagner et al. teaches a method, wherein the oxide surface comprises a metal oxide (p6, paragraph [0075]).

With respect to claim 7, the current specification teaches that native oxides of stainless steel includes chromium oxide and iron oxide (p18, paragraph [0060]). Wagner et al. teaches a method, wherein the metal oxide comprises chromium and iron oxides (p8, paragraph [0093]). Since Wagner et al. teaches that multiple interlayers may be used together (p4, paragraph [0057]), the substrate of Wagner combined with an interlayer of metal oxide comprising chromium oxide or iron oxide is interpreted as being the currently recited substrate.

With respect to claim 8, Wagner et al. fails to specifically teach a method, wherein the plasma is formed from a source gas comprising water, oxygen, or a mixture thereof. Hubbell et al. teaches a method, wherein the plasma is formed from a source

of gas comprising water in order to increase the number of hydroxyl groups at the oxide surface (p14, paragraph [212]), wherein the oxide surface includes stainless steel (p12, paragraph [0178]). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the plasma formed on the native oxide of stainless steel from a source of gas comprising water as taught by Hubbell et al. in the method of Wagner et al. in order to form hydroxyl groups on metal oxides.

With respect to claim 13, Wagner et al. teaches a method, wherein the biomolecule is oligonucleotides (p3, paragraph [0039]).

With respect to claim 14, Wagner et al. teaches a method, wherein the biomolecule is a protein (p3, paragraph [0038]).

11. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. (U.S. PG Pub. No. US 2002/0110932, Aug. 15, 2002) in view of Hubbell et al. (U.S. PG Pub. No. US 2002/0128234, Sept. 12, 2002) and Schössler et al. (U.S. Patent No. 4,822,681, April 18, 1989) as applied to claim 1 above, and further in view of Laibinis et al. (WO 01/83826 A2, Nov. 8, 2001).

Wagner et al. in view of Hubbell et al. and Schössler et al. teaches a method of treating a surface of a substrate as discussed above. However, Wagner et al. in view of Hubbell et al. and Schössler et al. fails to teach a method, wherein the epoxy-functional molecules are epichlorohydrin molecules.

Laibinis et al. teaches that epichlorohydrin reacts with hydroxyl moiety of a glass (substrate surface) to provide a surface having epoxide functional groups (p19, lines 14-17).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ epichlorohydrin, which contains epoxy functional groups as taught by Laibinis et al. in the method of Wagner et al. in view of Hubbell et al. and Schössler et al. in order to react with hydroxyl groups of oxide surface. The advantage of providing a surface having epoxy functional groups, which can be used to immobilize biological molecules, provides the motivation to combine the teachings of by Laibinis et al. and Wagner et al. in view of Hubbell et al. and Schössler et al. with a reasonable expectation of success as epoxy functional groups of epichlorohydrin can be used to react with hydroxyl groups of the oxide surface to functionalize the surface for immobilizing biomolecules.

12. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. (U.S. PG Pub. No. US 2002/0110932, Aug. 15, 2002) in view of Hubbell et al. (U.S. PG Pub. No. US 2002/0128234, Sept. 12, 2002) and Schössler et al. (U.S. Patent No. 4,822,681, April 18, 1989) as applied to claim 1 above, and further in view of Devoe et al. (WO 01/96452 A2, Dec. 20, 2001).

Wagner et al. in view of Hubbell et al. and Schössler et al. teaches a method of treating a surface of a substrate as discussed above. However, Wagner et al. in view of

Hubbell et al. and Schössler et al. fails to teach a method, wherein the epoxy-functional molecules are 1,4-butanediol diglycidyl ether molecules.

Devoe et al. teaches that numerous commercially available epoxy resins including 1,4-butanediol diglycidyl ether can be used apply on a solid surface (Abstract and p13, line 12).

Therefore, it would have been obvious matter of design choice to modify the Wagner et al. in view of Hubbell et al. and Schössler et al. to include 1,4-butanediol diglycidyl ether of Devoe et al. as epoxy-functional molecules, since Applicant has not disclosed that 1,4-butanediol diglycidyl ether does not solve any stated problem or is for any particular purpose and it appears that using 1,4-butanediol diglycidyl ether would provide a functionalized substrate surface for immobilization of biomolecules with a reasonable expectation of success as epoxy functional groups of 1,4-butanediol diglycidyl ether can be used to react with hydroxyl groups of the oxide surface to functionalize the surface for immobilizing biomolecules.

13. Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. (U.S. Patent No. PG Pub. No. US 2002/0110932, Aug. 15, 2002) in view of Hubbell et al. (U.S. PG Pub. No. US 2002/0128234, Sept. 12, 2002) and Schössler et al. (U.S. Patent No. 4,822,681, April 18, 1989) as applied to claim 1 above, and further in view of Dang et al. (U.S. PG Pub. No. 2003/0113478, Filed Dec. 12, 2001).

Wagner et al. in view of Hubbell et al. and Schössler et al. teaches a method of treating a surface of a substrate for immobilization of biomolecules as discussed above.

However, Wagner et al. in view of Hubbell et al. and Schössler et al. fails to teach a method, further comprising extending the spacer chains by reacting the spacer chains with gas-phase spacer molecules in situ in the absence of plasma to provide extended spacer chains, wherein the spacer molecules comprise an amine group capable of reacting with epoxy functionality of the spacer chains.

Dang et al. teaches a method of forming a coating on a substrate with a surface-modifying group, which can further react with a biologically active component resulting in a substrate with an immobilized bioactive agents such as nucleic acids and proteins (p2, paragraph [0026] and p6, paragraph [0084]). Dang et al. further teaches that it may be desirable to place one or more additional compounds as a multi-functional linker between chemically functional groups and bioactive agents to increase space between the substrate layer and the bioactive agents or to reduce undesirable responses such as steric hindrances between the functional group and the immobilized bioactive/biocompatible agents, which may limit the approach of the bioactive/biocompatible agent to the functional group, and physical bulk, electrostatic repulsion, or inappropriate positioning of the bioactive/biocompatible agent or agents, which may also contribute to reduced efficiency of the immobilized bioactive/biocompatible agent or agents (p5, paragraph [0077]). Suitable compounds for use as multi-functional linkers include epoxies and amines and can be heterofunctional or homofunctional (p5, paragraph [0078]). The available functional groups or surface-modifying groups are used to covalently or non-covalently bind the bioactive agent possessing desirable properties to substrate (p5, paragraph [0080]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ an additional spacer molecule (X-R-Y) as taught by Dang et al. in the method of Wagner et al. in view of Hubbell et al. and Schössler et al., in which reacting a gas comprising spacer molecules with the oxide surface in situ in the absence of plasma, in order to further coat the oxide surface to increase space between the substrate layer and the bioactive agents or to reduce undesirable responses and immobilize bioactive agents such as nucleic acids and proteins via covalently interaction with surface-modifying groups, wherein the functional group of the additional spacer molecule includes amine group as Hubbell et al. teaches that functional groups such as epoxy can interact with amine groups . The advantage of reducing undesirable responses such as steric hindrances between the functional group and the immobilized bioactive/biocompatible agents, which may limit the approach of the bioactive/biocompatible agent to the functional group, and physical bulk, electrostatic repulsion, or inappropriate positioning of the bioactive/biocompatible agent or agents, which may also contribute to reduced efficiency of the immobilized bioactive/biocompatible agent or agents provides the motivation to combine the teachings of Dang et al. and Wagner et al. in view of Hubbell et al. and Schössler et al. with a reasonable expectation of success as one of ordinary skill in the art would recognize that additional spacer molecules would provide more efficient immobilization of biomolecules to the functionalized surface of the substrate.

Response to Arguments

14. Rejection of claims 1-8, 13, and 14 under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. in view of Hubbell et al. and Schössler et al.

Applicant's arguments filed on January 24, 2007 have been fully considered but they are not persuasive in view of previously stated grounds of rejection.

Applicant's argument that Wagner et al, Hubbell et al., and Schössler et al. fails to teach a method of treating a surface that includes the step of reacting the hydroxyl groups on a plasma treated surface with gas-phase epoxy functional molecules *in situ* is not found persuasive in view of previously stated grounds of rejection (see item 13 in the Office Action dated July 25, 2006). Wagner et al. teaches that methods for the formation of organic thin films include *in situ* growth from the surface, deposition by physisorption, spin-coating, chemisorption, self-assembly, or plasma-initiated polymerization from gas phase [p8, paragraph [0099]). Schössler et al. teaches a method of reacting hydroxyl-group-containing solid body surfaces with glycidoxypropyltriethoxysilane (column 4, lines 26-29). Schössler et al. further teaches that it is particularly advantageous to effect the activation in gaseous phase through employment of aerosols or by means of underpressure (column 4, lines 44-47). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ a method of reacting a gas comprising spacer molecules with epoxy functional groups as taught by Schössler et al. with the surface hydroxyl groups in situ in the absence of plasma as in the method of Wagner et al. as activation in gaseous phase through employment of aerosols or by means of underpressure provides an

activation technique, which has lower expenditure compared to other activation techniques.

With respect to arguments regarding claims 4 and 5, Wagner et al. teaches that plasma exposure can be used to directly activate or alter the substrate and create a coating as noted by the applicant on p9. Applicant's argument that Wagner et al. does not teach or suggest using plasma to produce hydroxyl groups on silicon oxide, silica, glass, or quartz surfaces because silicon oxide and glass are cited as examples of coating by Wagner et al. on p8, paragraph [0094] is not found persuasive. The passage of Wagner teaching silicon oxide and glass being used as coating is simply another embodiment of Wagner et al. Wagner et al. teaches that various types of substrates including silicon oxide, silica, glass, or quartz can be used to produce hydroxyl groups using plasma.

15. Rejection of claims 9 and 10 under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. in view of Hubbell et al. and Schössler et al., and further in view of Laibinis et al.

Applicant's arguments filed on January 24, 2007 have been fully considered but they are not persuasive in view of previously stated grounds of rejection and response to arguments set forth above (see item 14 above).

16. Rejection of claims 11 and 12 under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. in view of Hubbell et al. and Schössler et al., and further in view of Devoe et al.

Applicant's arguments filed on January 24, 2007 have been fully considered but they are not persuasive in view of previously stated grounds of rejection and response to arguments set forth above (see item 14 above).

17. Rejection of claims 15-17 under 35 U.S.C. 103(a) as being unpatentable over Wagner et al. in view of Hubbell et al. and Schössler et al., and further in view of Dang et al.

Applicant's arguments filed on January 24, 2007 have been fully considered but they are not persuasive in view of previously stated grounds of rejection and response to arguments set forth above (see item 14 above).

18. Since the prior art fulfills all the limitations currently recited in the claims, the invention as currently recited would read upon the prior art.

Conclusion

19. No claim is allowed.

20. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Unsu Jung whose telephone number is 571-272-8506. The examiner can normally be reached on M-F: 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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